Small Business Innovation Research/Small Business Tech Transfer

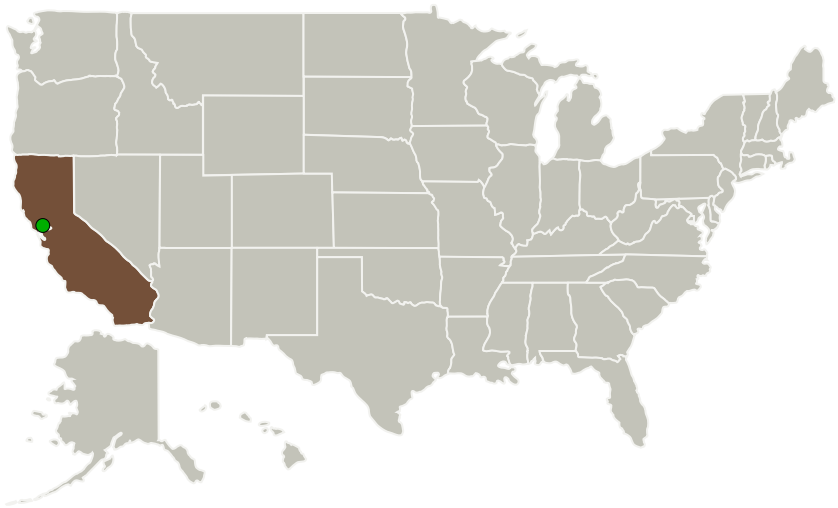
An Intelligent Consumables Management System Development Framework based on Artificial Intelligence Techniques, Phase I

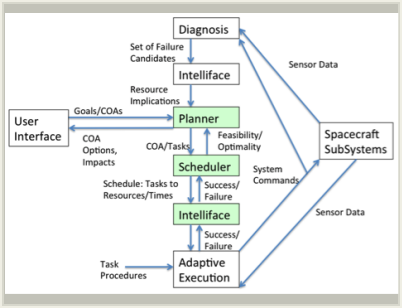
Completed Technology Project (2016 - 2016)

Project Introduction

The proposed innovation, called the Management of consumables Adaptive Execution, SynchronizaTion, Replanning/rescheduling, Optimization system (MAESTRO), would leverage the investment of NASA from originally funding the development of the Aurora Intelligent Scheduling framework and also leverage the previous NASA-funded Intelliface, to interface Aurora to diagnosis systems and extend it both to include more Course of Action (COA) development/planning and adaptive execution (i.e., executing the scheduled activities/procedures after scheduling). MAESTRO would be an open standards architecture and framework for the development of intelligent consumables management systems for autonomous and/or astronaut management of consumables. Each task (an abstract token) in a MAESTRO/Aurora schedule would be a procedure of several steps or actions that must be executed, and incorporating the Adaptive Execution capability of Intelliface (based on Open Source SimBionic) would allow the plans and schedules generated by MAESTRO to be adaptively executed. The Intelliface link to diagnosis systems allows the entire loop to be closed so that an autonomous or human-interfaced system can transition seamlessly between diagnosis, replanning, rescheduling, adaptive execution, etc. The generality of the proposed MAESTRO system will be proven, in Phase I, by using it to develop three separate consumable management systems for three separate applications using the same code base. Consumables management will be possible with significantly less skill and experience, less manpower, and reduced turnaround time. The multiple applications also show that MAESTRO is a general, open architecture.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Stottler Henke Associates, Inc.	Lead Organization	Industry	San Mateo, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Project Transitions

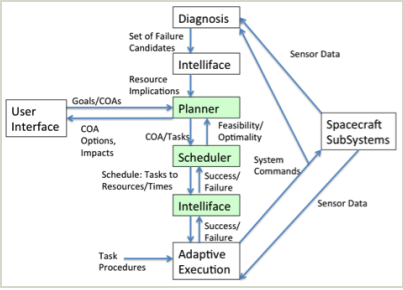
June 2016: Project Start

December 2016: Closed out

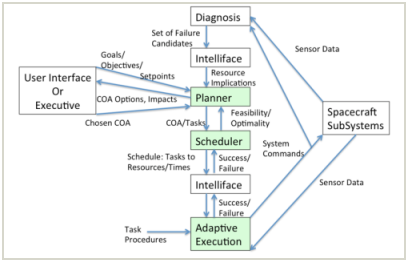
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139704)*

Images



Briefing Chart Image
An Intelligent Consumables Management System Development Framework based on Artificial Intelligence Techniques, Phase I *(https://techport.nasa.gov/image/130621)*



Final Summary Chart Image
An Intelligent Consumables Management System Development Framework based on Artificial Intelligence Techniques, Phase I Project Image *(https://techport.nasa.gov/image/127255)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Stottler Henke Associates, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

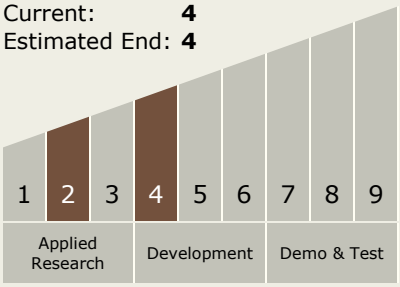
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Richard R Stottler

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.2 Reasoning and Acting
    - TX10.2.2 Activity and Resource Planning and Scheduling

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System